PROOF OF RESERVES AGREED-UPON PROCEDURES REPORT

Prepared for:

kraken

Management & Platform Clients

August 10, 2022

MOORE

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armanino

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Independent Accountant’s Report on Agreed-Upon Procedures

To Kraken Management and Platform Clients of Kraken:

We have performed the procedures enumerated below as of 11:59PM Coordinated Universal Time (“UTC”) on June 30, 2022. Management of Payward, Inc. (“Kraken”) has agreed to and acknowledged that the procedures performed are appropriate to meet the intended purpose of demonstrating that, at the time the procedures were performed, Kraken retained custody over a sufficient amount of the in-kind assets to cover the in-scope client liabilities as observed within the database related to Kraken’s spot exchange.

This report may not be suitable for any other purpose. The procedures performed may not address all the items of interest to a user of this report and may not meet the needs of all users of this report and, as such, users are responsible for determining whether the procedures performed are appropriate for their purposes.

The procedures and the associated findings are set forth in the attached sections:

- **Procedures:** Listing of all procedures requested by Kraken and performed by Armanino.
- **Findings & Results:** The results of the procedures performed by Armanino.

We were engaged by Kraken to perform this agreed-upon procedures engagement and conducted our engagement in accordance with attestation standards established by the American Institute of Certified Public Accountants. We were not engaged to and did not conduct an examination or review engagement, the objective of which would be the expression of an opinion or conclusion, respectively, related to the platform account liabilities and asset balances represented by Kraken. Accordingly, we do not express such an opinion or conclusion. Had we performed additional procedures, other matters might have come to our attention that would have been reported.

We are required to be independent of Kraken and to meet our ethical responsibilities in accordance with the relevant ethical requirements related to our agreed-upon procedures engagement.

This report is intended solely for the information and use of Kraken Management and Platform Clients of Kraken and is not intended to be and should not be used by anyone other than these specified parties. The practitioner’s report is as of a specified point in time and we have no responsibility to update the report or findings therein for subsequent points in time.

Armanino

Armanino CPA LLP
San Jose, California
August 10, 2022

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Procedures

General

1) Obtain an overview of Kraken's company background, business model and supported features via inquiry with Kraken Management and inspection of Kraken's website, www.Kraken.com.

2) Obtain a list of Client Liabilities and In-Kind Assets in scope for the Proof of Reserves assessment from Kraken Management.

Proving Client Account Balance Liabilities on the Kraken Trading Platform

3) Inspect the tables and scripts used by Kraken Management to pull client and balance data from the underlying database to ensure the logic and parameters are designed to pull a complete and accurate listing of client liabilities (excluding identified Kraken internal accounts) with the in-scope assets.

4) Observe Kraken Management access the production replica database used to generate the Client Liability Report extract. Observe Kraken Management execute the scripts from Procedure 3 to extract data from the production replica database and observe the total balance of the in-scope client liabilities and the total number of records from the executed scripts.

5) Observe Kraken Management extract the Client Liability Report from the production replica database with the output fields including PoR Record ID[1] and the in-scope client liabilities. Reconcile the total balance of the in-scope client liabilities and the total number of records observed in the report extract to the total balance and the total number of records observed in Procedure 4. Confirm Kraken internal accounts were not included within the Client Liability Report extract.

Utilizing the Merkle Tree Generator & Verifier[2]

6) Utilize the Merkle Tree Generator[3] to aggregate Kraken client data from the Client Liability Report extracted during the assessment and determine the Merkle Root Hash.

7) Randomly select a sample of 10 PoR Record IDs. For each sample, utilize the Verifier Tool on the TrustExplorer: Kraken Proof of Reserves Dashboard[4] to cryptographically test whether the PoR

[1] 'PoR Record ID,' or 'Proof of Reserves Record ID,' refers to an individual client's record included within the Proof of Reserves assessment.

[2] FAQ on the Merkle Tree can be found here: https://proof-of-reserves.trustexplorer.io/faq.

[3] The source code for the Merkle Tree Generator and Verifier has been open-sourced and is available for inspection here: https://github.com/armaninollp/proof-of-reserves-merkle-tree-tool.

[4] TrustExplorer is Armanino's proprietary blockchain-enabled assurance technology suite designed to increase trust for participants in the digital asset industry. Proof of Reserves, one of TrustExplorer's flagship solutions, is a report and client verification portal that enables digital asset platforms to prove the assets held on behalf of the clients. The Kraken Proof of Reserves webpage can be found here: https://proof-of-reserves.trustexplorer.io/clients/kraken.

Record IDs are included within the Merkle Tree. In addition, cryptographically test one sample 'dummy' account to confirm only valid PoR Record IDs are included within the Merkle Tree.

Proving Asset Ownership – Spot Assets, Staked DOT/ADA, & Parachain DOT

8) Obtain from Kraken Management a complete list of all addresses holding spot, staked, and parachain assets in-scope for the assessment and perform the following procedures:

   a. **Single Signature Addresses:** For each of the in-scope "single signature" addresses received, execute one of the following methods:

      i. Obtain a corresponding digital signature generated by Kraken Management with an Armanino-provided custom message. Cryptographically verify each digital signature is signed by the private key associated with a public address on the listing provided by Kraken Management.

      ii. Provide Kraken Management a specific amount of cryptocurrency to execute a "send-to-self" transaction. Receive a corresponding transaction hash from Kraken Management. Inspect the transaction details on the corresponding blockchain observing the amount, timestamp, and "sending" address match the specific parameters communicated.

   b. **Multi-Signature Addresses:** For each of the in-scope "multi-signature" addresses received, obtain the underlying addresses utilized to create the multi-signature address and obtain the corresponding digital signatures generated by Kraken Management with an Armanino-provided custom message for each address. Cryptographically verify each digital signature is signed by the private key associated with a public address utilized to create the multi-signature addresses on the listing provided by Kraken Management. Recreate each multi-signature address on the listing utilizing the underlying public addresses provided by Kraken Management.

Proving Asset Ownership – Staked ETH

9) Inquire and document Kraken Management's understanding of Ethereum 2.0 staking mechanics and associated Validator and Withdrawal key pairs.

10) Obtain from Kraken Management a complete list of ETH2 Validator Public Keys in-scope for the assessment. For each of the Public Keys received, query the Ethereum 2.0 Beacon Chain, and observe the related Withdrawal Credential address(es).

11) Obtain from Kraken Management the Withdrawal Public Key. Confirm the Withdrawal Credential observed in Procedure 10 is derived from the Withdrawal Public Key provided by Kraken Management. For the in-scope Withdrawal Public Key(s), obtain from Kraken Management the corresponding digital signature generated from an Armanino-provided custom message. Cryptographically verify whether the digital signature provided by Kraken Management was signed using the Armanino-provided custom message and the private key to the Withdrawal Public Key.

Proof of Reserves Assessment

12) Query all in-kind spot and staked asset addresses/keys in scope for the assessment and demonstrated to be controlled by Kraken Management.

13) For each of the in-scope DOT addresses received, aggregate the parachain DOT asset balance by adding the parachain crowdloan contribution amounts and subtracting the parachain crowdloan refund and dissolved amounts at the specified assessment time.

14) Compare the total liabilities from the Client Liability Report extracted from Kraken's production database as observed within Procedure 5 to the total assets controlled by the Kraken custodied addresses (the "In-Kind Assets") as of the specified date and time of the assessment time and calculate the collateralization ratio based on the In-Kind Asset-to-Client Liability mapping provided by Kraken Management.

Findings & Results

Armanino completed the agreed-upon procedures as outlined above with the following findings and results:

General

1) Obtain an overview of Kraken's company background, business model and supported features via inquiry with Kraken Management and inspection of Kraken's website, www.Kraken.com.

Results: Armanino inquired with Kraken Management to gain an understanding of the Company's background and business model recording the following:

Kraken is a United States-based cryptocurrency exchange headquartered in San Francisco, California. Through its platform, the Company offers cryptocurrency to fiat trading as well as futures, staking, and over the counter ("OTC") services. The platform is divided into two market exchanges:

- **Kraken Spot Exchange**: For the purchase, sale, and staking of cryptocurrencies using spot and margin transactions.
- **Kraken Futures Exchange**: For trading cryptocurrency futures contracts.

The scope of the Proof of Reserves assessment includes *only* client liabilities and associated collateral assets on the Kraken *spot* exchange.

As of the report date, Kraken supports over 110 different cryptocurrencies and is available for residents of over 190 countries and in 13 languages. Kraken custodies all assets collateralizing the client liabilities for the Kraken spot exchange and has also received the special purpose depository institution ("SPDI") designation from Wyoming, making Kraken one of the first cryptocurrency exchanges to hold a bank charter.

2) Obtain a list of Client Liabilities and In-Kind Assets in scope for the Proof of Reserves assessment from Kraken Management.

Armanino obtained from Kraken Management the full list of in-scope client liabilities as of 11:59PM UTC on June 30, 2022. Kraken client liabilities were described by Kraken Management as client claims on assets held in the Kraken spot exchange trading accounts. The client liabilities in scope for the assessment were:

In-Scope Client Liabilities for PoR as of Time of Assessment

Liability	Description
ADA	ADA held in custody on behalf of clients by Kraken
ADA.S	ADA staked on behalf of clients on the Cardano network
BTC	BTC held in custody on behalf of clients by Kraken
BTC.M	BTC held in custody on behalf of clients by Kraken in separate interest-accruing margin pools and opportunities
DOT	DOT held in custody on behalf of clients by Kraken
DOT.S	DOT staked on behalf of clients on the Polkadot network
DOT.P	DOT bonded for parachain auctions on behalf of clients

Liability	Description
ETH	ETH held in custody on behalf of clients by Kraken
ETH2.S	ETH staked on behalf of clients to support the Ethereum 2.0 network upgrade. ETH2.S cannot be un-staked, deposited, or withdrawn until the Ethereum 2.0 network upgrade is complete. ETH2.S represents "principal" ether staked and does not represent rewards earned from staking. A separate ticker, ETH2, represents ether that is earned as staking rewards.
USDC	USDC held in custody on behalf of clients by Kraken
USDT	USDT held in custody on behalf of clients by Kraken
XRP	XRP held in custody on behalf of clients by Kraken

Armanino then obtained from Kraken Management the in-scope in-kind asset balances as of 11:59PM UTC on June 30, 2022. Kraken in-kind assets were described by Kraken Management assets held on behalf of platform customers. The in-kind assets in scope for the assessment were:

In-Kind Assets for PoR as of Time of Assessment

Asset	Description
Cardano ("ADA")	Spot ADA held in Kraken custody
Staked ADA	ADA staked on the Cardano network
Bitcoin ("BTC")	Spot BTC held in Kraken custody [5]
Polkadot ("DOT")	Spot DOT held in Kraken custody
Staked DOT	DOT staked on the Polkadot network
Parachain DOT	DOT bonded for parachain auctions, see Kraken.com for further details
Ether ("ETH")	Spot ETH held in Kraken custody
Staked ETH	ETH staked on the Ethereum 2.0 beacon chain
USD Coin ("USDC")	Spot USDC, on Ethereum, held in Kraken custody
USD Tether ("USDT")	Spot USDT, on Ethereum, Tron, and Omni, held in Kraken custody
XRP	Spot XRP held in Kraken custody

Proving Client Account Balance Liabilities on the Kraken Trading Platform

3) Inspect the tables and scripts used by Kraken Management to pull client and balance data from the underlying database to ensure the logic and parameters are designed to pull a complete and accurate listing of client liabilities (excluding identified Kraken internal accounts) with the in-scope assets.

Results: On August 9, 2022, Armanino met with Kraken's data engineer to gain an understanding of the scripts and tables used to extract client liability balance data for the Client Liability Report extract used within the Proof of Reserves Assessment.

Armanino observed the following tables used to derive the client liability balance data:

- **[Table #1]**: Table of the most recent client balances, both for client accounts and Kraken Internal Accounts
- **[Table(s) #2]**: Table(s) of all the historical transactions
- **[Table #3]**: Table of metadata (such as ticker symbol and appropriate decimal places) related to the currencies supported on the exchange platform

[5] Bitcoin escrowed within lightning channels were excluded from the scope of the assessment.

- **[Table #4]**: Table of information related to client accounts and identification

Armanino then inspected the scripts used to extract data from the observed tables to compile the data into the Client Liability Report extract used for the Proof of Reserves assessment. Armanino observed the following **key functions used in the script** to compile the Client Liability Report:

- **Asset Balance Rollback**: Script to roll back the transactions from the most recent balance data to the specified point in time and arrive at the historical balance (matching the 'as of' date of the Proof of Reserves assessment) using [Table #1] and [Table(s) #2]
- **Exclude Internal Accounts**: Script to exclude Kraken internal accounts with non-custodial balances. Armanino observed the script exclude specific accounts identified by Kraken Management to be Kraken internal accounts that hold non-custodial (i.e., non-client) balances. Additionally, Armanino observed Kraken's record of internal accounts stored separately from the underlying database and confirmed the accounts excluded in the script reconciled to the accounts with non-custodial balances within Company records.
- **Filter for Assets**: Script to filter for *only* in scope liability types using [Table #3]
- **Incorporate PoR Record ID**: Script to include the PoR Record ID related to each client account from [Table #4]
- **Remove Negative Balances**: Script to convert the negative balances to zero. Per Kraken Management, the negative balances on some client accounts represented balances that are owed to Kraken by the client and are not expected to be collected by Kraken. The client accounts with negative asset balances are not entitled to assets held by Kraken and therefore, do not represent Kraken liabilities. Armanino confirmed these negative balances were excluded from the Customer Liability Extract for the purposes of the Proof of Reserve Assessment.

4) Observe Kraken Management access the production replica database used to generate the Client Liability Report extract. Observe Kraken Management execute the scripts from Procedure 3 to extract data from the production replica database and observe the total balance of the in-scope client liabilities and the total number of records from the executed scripts.

Results: On August 9, 2022, Armanino observed the data engineer access the production replica database and the underlying tables used to generate the Client Liability Report extract.

Armanino observed the data engineer execute the scripts observed in Procedure 3 to generate the client liability data within the production replica database and observed the relevant columns and total record count. Armanino then observed the data engineer sum the client liability data within the production replica database and observed the following details:

'As of' Time: 2022-06-30 23:59:59
Total Balance of the In-Scope Client Liabilities:

- **ADA:** 457,551,008.3461023
- **ADA.S:** 736,827,342.6983324
- **BTC:** 169,848.82583425075
- **BTC.M:** 6,356.128515790012
- **DOT:** 13,293,568.956877695
- **DOT.S:** 102,870,356.35708272
- **DOT.P:** 8,813,414.902963586
- **ETH:** 2,105,556.5504135382
- **ETH2.S:** 1,112,676.30371863

- **USDC:** 512,101,343.6635222
- **USDT:** 394,281,457.52373475
- **XRP:** 838,297,002.2625571

5) Observe Kraken Management extract the Client Liability Report from the production replica database with the output fields PoR Record ID[6] and the in-scope client liabilities. Reconcile the total balance of the in-scope client liabilities and the total number of records observed in the report extract to the total balance and the total number of records observed in Procedure 4. Confirm Kraken internal accounts were not included within the Client Liability Report extract.

Results: On August 9, 2022, Armanino observed Kraken's data engineer extract the client liability data from the production replica database with parameters including the PoR Record ID and Kraken account platform balances for the in-scope liabilities observed within Procedure 2. Armanino observed the data extracted from the production replica database as a csv file and observed the data engineer save the file on the data engineer's desktop. Subsequently, Armanino observed Kraken's data engineer upload the data extract to a secure file-sharing portal.

Armanino summed the total record count and total asset balances from the Client Liability Report extract, and confirmed the totals reconciled to the total record count observed in the production replica database during the observation with Kraken Management.

Additionally, to confirm Kraken non-custodial internal accounts were not included within the Client Liability Report extract, Armanino queried the Client Liability Report extract with the list of Kraken non-custodial internal account PoR Record IDs and confirmed the queried Kraken non-custodial internal accounts were *not* included within the Client Liability Report extract.

Cryptographically Testing the Merkle Tree Generator & Verifier[7]

6) Utilize the Merkle Tree Generator to aggregate Kraken client data from the Client Liability Report extracted during the assessment and determine the Merkle Root Hash.

Results: Armanino then prepared the Client Liability Report extract for Merkle Tree generation.[8] Subsequent to the assessment date, Armanino utilized the Client Liability Report extract provided by Kraken's data engineer as of August 9, 2022. Armanino noted the total record count and balances of the in-scope client liabilities observed in Procedures 4 and 5.

Total Balance of the In-Scope Client Liabilities:

- **ADA:** 457,551,008.3461023

[6] 'PoR Record ID,' or 'Proof of Reserves Record ID,' refers to an individual client's record included within the Proof of Reserves assessment.

[7] FAQ on the Merkle Tree can be found here: https://proof-of-reserves.trustexplorer.io/faq.

[8] In order to protect Kraken Company and client confidentiality, additional supplemental records were added as "padding" to the raw export in order to protect the total record count from being deduced from the Merkle Tree structure. All supplemental records had no balances and do not contribute to the total client liability balances in any way.

- **ADA.S:** 736,827,342.6983324
- **BTC:** 169,848.82583425075
- **BTC.M:** 6,356.128515790012
- **DOT:** 13,293,568.956877695
- **DOT.S:** 102,870,356.35708272
- **DOT.P:** 8,813,414.902963586
- **ETH:** 2,105,556.5504135382
- **ETH2.S:** 1,112,676.30371863
- **USDC:** 512,101,343.6635222
- **USDT:** 394,281,457.52373475
- **XRP:** 838,297,002.2625571

A Merkle Tree Verifier enables clients to cryptographically verify client account details were included within the Proof of Reserves Assessment by cryptographically linking each individual client's Merkle Leaf (which is a client's hashed PoR Record ID) to the Merkle Root. The Merkle Root is an aggregation of all client liability account balances in scope for the Proof of Reserve Assessment truncated into a single summary hash.

Armanino then utilized the Merkle Tree Generator[9] to generate a Merkle Tree from the Client Liability Report extracted during the assessment and determined the Root Hash to be:

c15eddb9e26a27c64a792e512a96e986a5daf83ce46000bfcb0a73a2e4510da9

Armanino confirmed the additional informational outputs generated from the Merkle Tree Generator, such as total record count and asset balances, reconciled to the total record count and asset balances from the Client Liability Report.

7) Randomly select a sample of 10 PoR Record IDs. For each sample, utilize the Verifier Tool on the TrustExplorer: Kraken Proof of Reserves Dashboard[10] to cryptographically test whether the PoR Record IDs are included within the Merkle Tree. In addition, cryptographically test one sample 'dummy' account to confirm only valid PoR Record IDs are included within the Merkle Tree.

Results: Subsequent to the assessment date, Armanino randomly selected a sample of 10 PoR Record IDs and utilized the Verifier Tool to cryptographically test whether the PoR Record ID and the balances were included within the Merkle Generator Output. For each sample, Armanino input the PoR Record ID and the in-scope liability amounts into the Merkle Verifier. Armanino confirmed that all 10 samples were found within the Merkle Tree. Additionally, Armanino input fictitious account details into the Verifier Tool and confirmed the dummy account was not found within the Merkle Tree.

[9] The source code for the Merkle Tree Generator and Verifier has been open-sourced and is available for inspection here: https://github.com/armaninollp/proof-of-reserves-merkle-tree-tool.

[10] TrustExplorer is Armanino's proprietary blockchain-enabled assurance technology suite designed to increase trust for participants in the digital asset industry. Proof of Reserves, one of TrustExplorer's flagship solutions, is a report and client verification portal that enables digital asset platforms to prove the assets held on behalf of the clients. The Kraken Proof of Reserves webpage can be found here: https://proof-of-reserves.trustexplorer.io/clients/kraken.

Proving Asset Ownership – Spot Assets, Staked DOT/ADA, & Parachain DOT

8) Obtain from Kraken Management a complete list of all addresses holding spot, staked, and parachain assets in-scope for the assessment and perform the following procedures:

a. **Single Signature Addresses: For each of the in-scope "single signature" addresses received, execute one of the following methods:**

   i. **Obtain a corresponding digital signature generated by Kraken Management with an Armanino-provided custom message. Cryptographically verify each digital signature is signed by the private key associated with a public address on the listing provided by Kraken Management.**

   ii. **Provide Kraken Management a specific amount of cryptocurrency to execute a "send-to-self" transaction. Receive a corresponding transaction hash from Kraken Management. Inspect the transaction details on the corresponding blockchain observing the amount, timestamp, and "sending" address match the specific parameters communicated.**

b. **Multi-Signature Addresses: For each of the in-scope "multi-signature" addresses received, obtain the underlying addresses utilized to create the multi-signature address and obtain the corresponding digital signatures generated by Kraken Management with an Armanino-provided custom message for each address. Cryptographically verify each digital signature is signed by the private key associated with a public address utilized to create the multi-signature addresses on the listing provided by Kraken Management. Recreate each multi-signature address on the listing utilizing the underlying public addresses provided by Kraken Management.**

Results: From July 29, 2022 through August 9, 2022, Armanino obtained a list of Kraken addresses holding spot, staked, and parachain assets in-scope for the assessment.

Single Signature Addresses: For each in-scope "single-signature" address received (excluding XRP), Armanino obtained a corresponding digital signature generated by Kraken Management with an Armanino-provided custom message. Subsequently, Armanino verified each digital signature was signed by the private key associated with a public address on the listing provided by Kraken Management.

For addresses that could not be verified by digital signatures, Armanino provided Kraken Management a specific amount of cryptocurrency to execute a "send-to-self" transaction. After receiving the transaction hash, Armanino inspected transaction details on the corresponding blockchain, noting the amount, timestamp, and "sending" address matched the specific parameters communicated.

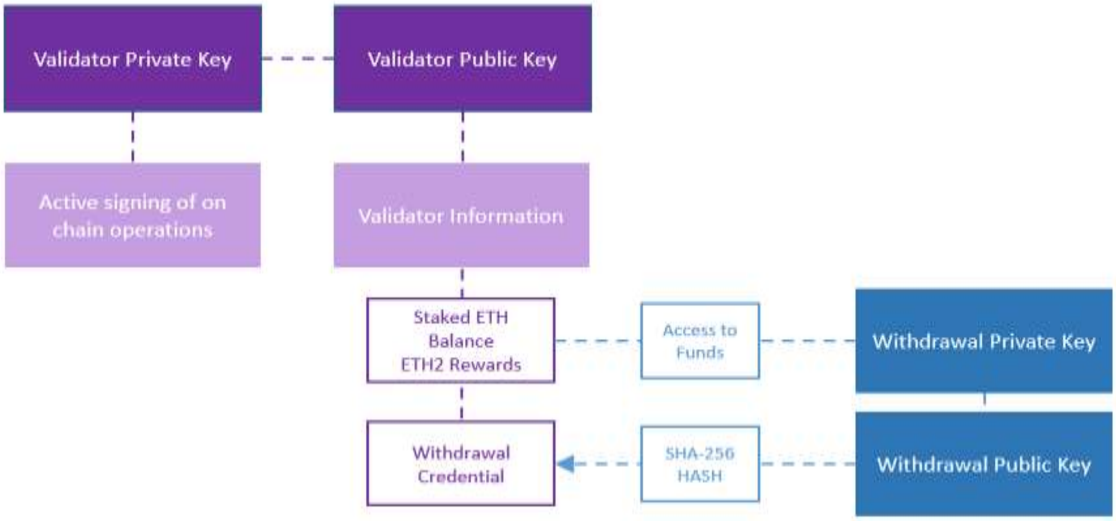
For each XRP address received, Armanino provided Kraken Management an amount of 0.59199 XRP, derived independently from Kraken, to execute a "send-to-self" transaction. Subsequent to providing the amount to Kraken Management, Armanino received a transaction hash for each in-scope address. Armanino then queried an independent XRP block explorer with the provided transaction hash and confirmed the source address and destination address per the transaction hash were both in-scope Kraken XRP addresses. Additionally, Armanino confirmed each "send-to-self" transaction executed by Kraken Management sent 0.59199 XRP.

Multi-Signature Addresses: For each of the in-scope "multi-signature" addresses received, Armanino obtained the underlying addresses utilized to create the multi-signature address and obtained the corresponding digital signatures generated by Kraken Management with an Armanino-provided custom message for each address. Subsequently, Armanino verified each digital signature was signed by the private key associated with the public address utilized to create the multi-signature addresses. Armanino also successfully recreated each multi-signature address on the listing utilizing the underlying public addresses provided by Kraken Management.

Proving Asset Ownership – Staked ETH

9) Inquire and document Kraken Management's understanding of Ethereum 2.0 staking mechanics and associated Validator and Withdrawal key pairs.

Armanino inquired of Kraken Management noting Kraken provides ETH2 staking services for clients on the Kraken spot exchange. The ETH2.S platform liabilities represent bonded client claims on the ether assets held in the ETH2 deposit contract. The staked ETH assets are locked until the Ethereum 2.0 Beacon Chain upgrade is complete. The following are the relevant key pairs related to the Ethereum 2.0 Beacon Chain:



Kraken Management further confirmed there are two relevant key pairs related to each ETH2 Validator Node:

1) Validator Keys: The Validator Public/Private key pair is created initially upon the deposit of ether into the deposit contract.

- **Validator Public Key**: The Validator Public Key is used to retrieve ETH2 Validator information, such as the staked ETH balance as well as the staking rewards. All ETH2 Validators have an associated Withdrawal Credential (see Withdrawal Keys description below), which can also be retrieved using the Validator Public Key.
- **Validator Private Key**: The Validator Private Key is used for active signing of on-chain operations such as block proposals and attestations on the Ethereum 2.0 Beacon Chain.

2) Withdrawal Keys: The Withdrawal Public/Private key pair represents ownership to the staked ETH balance held in the Validator Key.

- **Withdrawal Public Key**: The Withdrawal Public Key is a hash of the Withdrawal Private Key and a pre-image to the Withdrawal Credential. The Withdrawal Public Key also acts as an intermediary step to create the Withdrawal Credential from the Withdrawal Private Key.
- **Withdrawal Credential:** The Withdrawal Credential is the hash of the Withdrawal Public Key that is used as a public identifier to identify who has rights to withdraw funds from a Validator Node.
- **Withdrawal Private Key**: Once the Beacon Chain upgrade is complete, the Withdrawal Private Key can be used for withdrawing the staked ETH funds and rewards from the Validator. Ownership of the Withdrawal Private Key represents ownership of the staked ETH balances and rewards held in the Validator.

10) Obtain from Kraken Management a complete list of ETH2 Validator Public Keys in-scope for the assessment. For each of the Public Keys received, query the Ethereum 2.0 Beacon Chain, and observe the related Withdrawal Credential address(es).

Results: Armanino received from Kraken Management a list of ETH2 Validator Public Keys in scope for the assessment and queried the Ethereum 2.0 Beacon Chain for staked ETH balances and associated Withdrawal Credentials. Included within the list were Validator Nodes that had ether (minimum of 32 ether) sent to the Validator Deposit Contract on the Ethereum 1.0 Chain and pending activation on the Ethereum 2.0 Beacon Chain as long as the Validator Nodes were eventually activated. Armanino confirmed all Validators that had ether sent to the Deposit Contract on the Ethereum 1.0 Chain, but not yet eligible and activated as of the assessment cut off time, were subsequently successfully activated. Therefore, the balances of the Validator Nodes provided by Kraken were applicable to include as collateral against the ETH2.S liabilities as of the assessment time. Armanino observed the following details:

- **Total Staked ETH2 Balance**: 1,112,736.00 ETH
- **Withdrawal Credential**: 0x004f58172d06b6d54c015d688511ad5656450933aff85dac123cd09410a0825c

Armanino confirmed all of Kraken's *Validator* Public Keys had the same *Withdrawal Credential*, derived from the same Withdrawal Public Key. Therefore, Armanino confirmed one Withdrawal Key pair in scope for the assessment.

11) Obtain from Kraken Management the Withdrawal Public Key. Confirm the Withdrawal Credential observed in Procedure 10 is derived from the Withdrawal Public Key provided by Kraken Management. For the in-scope Withdrawal Public Key(s), obtain from Kraken Management the corresponding digital signature generated from an Armanino-provided custom message. Cryptographically verify whether the digital signature provided by Kraken Management was signed using the Armanino-provided custom message and the private key to the Withdrawal Public Key.

Results: Prior to the assessment date, Armanino obtained the in-scope Withdrawal Public Key from Kraken Management. Armanino confirmed the Withdrawal Credential observed in Procedure 10 was derived from the Withdrawal Public Key provided by Kraken Management by applying the SHA256 hash function to the Withdrawal Public Key and noting the following output:

Hash Input: Withdrawal Public Key:
86e9b1d91219e3c34fac7aaeb831d2a95586e8b7f5b392ccbbe67ed5d3b509b199b798db149ca49d4e42f5c0aa6008f0

Hash Output: Withdrawal Credential:
0e4f58172d06b6d54c015d688511ad5656450933aff85dac123cd09410a0825c

To demonstrate that, at the time of the assessment, Kraken retained control of the Withdrawal Private Key for each Validator, Kraken signed a custom message provided by Armanino with a digital signature using the Withdrawal Private Key that was related to *all* Validator Nodes Kraken had staked ETH assets with on behalf of clients. Armanino subsequently verified whether the digital signature was signed using the Armanino-provided custom message and the Withdrawal Private Key.

Proof of Reserves Assessment

12) Query all in-kind spot and staked asset addresses/keys in scope for the assessment and demonstrated to be controlled by Kraken Management.

Results: Armanino retrieved, from the respective blockchains, the balances of all addresses/keys in-scope for the assessment and tested in procedures 8-11. Armanino obtained the in-scope asset balances as of 11:59PM UTC on June 30, 2022 and documented the results below:

Asset	Balance	Block Height / Epoch
ADA	470,670,834.673422	7441139
Staked ADA	738,231,080.881982	7441139
BTC	180,149.31591	743087
DOT	19,157,005.69	10969141
Staked DOT	98,290,023.00	10969141
ETH	2,113,030.00443456	15053225
Staked ETH	1,112,736.00	129712
USDC (ETH)	519,424,421.288948	15053225
USDT (ETH)	233,622,071.274517	15053225
USDT (TRON)	150,935,142.902361	42021419
USDT (OMNI)	20,025,669.2394757	743087
XRP	853,678,443.55802	72699560

13) For each of the in-scope DOT addresses received, aggregate the parachain DOT asset balance by adding the parachain crowdloan contribution amounts and subtracting the parachain crowdloan refund and dissolved amounts at the specified assessment time.

Results: For all in scope asset addresses on the Polkadot relay chain, Armanino retrieved all parachain crowdloan contributions and all parachain refund and dissolved amounts as of the assessment time. Armanino subtracted the parachain refund and dissolved balances from the parachain crowdloan contribution balance to calculate the net in-scope Parachain DOT asset balance as of 11:59PM UTC on June 30, 2022, and documented the results below:

Asset	Balance	Block Height / Epoch
Parachain Contributions	9,347,681.77009095	10969141
Parachain Refunds	0	10969141
Parachain Dissolutions	534,013.16453709	10969141
Net Parachain DOT	8,813,668.60555386	10969141

14) Compare the total liabilities from the Client Liability Report extracted from Kraken's production database as observed within Procedure 5 to the total assets controlled by the Kraken custodied addresses (the "In-Kind Assets") as of the specified date and time of the assessment time and calculate the collateralization ratio based on the mapping provided by Kraken Management.

Armanino confirmed all in-scope records of Kraken spot exchange client liabilities were included in the client database as aggregated in the Merkle Tree with the Merkle Root Hash:

c15eddb9e26a27c64a792e512a96e986a5daf83ce46000bfcb0a73a2e4510da9

Armanino confirmed Kraken retained control over in-kind assets in excess of client liabilities as observed within the database related to Kraken's spot exchange as of 11:59PM UTC June 30, 2022, with the results below:

Results as of:
ADA Block Height: **7441139** | BTC Block Height: **743087** | DOT Block Height: **10969141** | ETH Block Height: **15053225** | ETH2 Epoch: **129712** | TRON Block Height: **42021419** | XRP Ledger: **72699560**

Kraken Spot Exchange	Client Liabilities	In-Kind Assets	Chains of Underlying Assets	Collateralization Ratio
ADA	457,551,008.35 ADA	470,670,834.67 ADA	**Cardano**	**102.87%**
ADA.S	736,827,342.70 ADA.S	738,231,080.88 Staked ADA	**Cardano**	**100.19%**
BTC	169,848.83 BTC	180,149.32 BTC	**Bitcoin**	**102.24%**
BTC.M	6,356.13 BTC.M			
DOT	13,293,568.96 DOT	19,157,005.69 DOT	**Polkadot**	**101.10%**[11]
DOT.S	102,870,356.36 DOT.S	98,290,023.00 Staked DOT		
DOT.P	8,813,414.90 DOT.P	8,813,668.61 Parachain DOT	**Polkadot**	**100.00%**
ETH	2,105,556.55 ETH	2,113,030.00 ETH	**Ethereum**	**100.35%**
ETH2.S	1,112,676.30 ETH2.S	1,112,736.00 Staked ETH	**Ethereum 2.0**	**100.01%**
USDC	512,101,343.66 USDC	519,424,421.29 USDC	**Ethereum**	**101.43%**
USDT	394,281,457.52 USDT	233,622,071.27 USDT	**Ethereum**	**102.61%**
		150,935,142.90 USDT	**Tron**	
		20,025,669.24 USDT	**Omni Layer (Bitcoin)**	
XRP	838,297,002.26 XRP	853,678,443.56 XRP	**XRP Ledger**	**101.83%**

[11] Per inquiry with Kraken Management, Kraken provides instant unbonding of DOT.S on the Kraken Spot Exchange. However, the Polkadot network requires 28 days for DOT to be unbonded on chain. Therefore, Kraken holds excess liquidity in DOT to cover the DOT.S liabilities.